

# SCIENCE

VOL. 77

FRIDAY, JUNE 9, 1933

No. 2006

<i>The National Academy of Sciences:</i> DR. W. W. CAMPBELL .....	549	GEORGE E. JOHNSON. <i>The Texas Academy of Science:</i> H. B. PARKS .....	563
<i>A History of the National Research Council, 1919-1933. IV. Division of Chemistry and Chemical Technology:</i> PROFESSOR CHARLES A. KRAUS .....	552	<i>Scientific Apparatus and Laboratory Methods:</i> <i>A Simple Aquarium Aerator:</i> DR. ERNEST C. DRIVER. <i>A New Stop-cock Clamp:</i> DR. ALDEN F. ROE .....	565
<i>Scientific Events:</i> <i>Chicago Program on Radiation and Plant Life; Mathematics at the Chicago Meeting; Chemistry at the Chicago Meeting; The Medical Sciences at the Chicago Meeting; The American Society and Journal for Pharmacology and Experimental Therapeutics; Obituary</i> .....	554	<i>Special Articles:</i> <i>The Action of the Parenteral Administration of Sugars on the Hydrogen-ion Concentration of Normal and Malignant Tissues in Living Animals:</i> PROFESSOR CARL VOEGTLIN, DR. H. KAHLER and DR. R. H. FITCH. <i>Solar Variations and Atmospheric Pressure:</i> H. H. CLAYTON .....	567
<i>Scientific Notes and News</i> .....	557	<i>Science News</i> .....	8
<i>Discussion:</i> <i>Meaningless versus Significant Terms in Geological Classification:</i> DR. FRANK LEVERETT. <i>Three Prehistoric Parasites:</i> DR. GALE E. WILSON. <i>The Distribution of Serapias Helleborine in Central New York:</i> DR. VERNON A. YOUNG. <i>I-inositol in Citrus Fruits:</i> E. K. NELSON and GEORGE L. KEENAN .....	560		
<i>Special Correspondence:</i> <i>The Leonard Wood Memorial for the Eradication of Leprosy:</i> F. P. G. ....	562		
<i>Societies and Meetings:</i> <i>The Iowa Academy of Science:</i> DR. JOSEPH C. GILMAN. <i>The Kansas Academy of Science:</i> DR.			

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKEEN CATTELL and published every Friday by

## THE SCIENCE PRESS

New York City: Grand Central Terminal  
Lancaster, Pa. Garrison, N. Y.  
Annual Subscription, \$6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

## THE NATIONAL ACADEMY OF SCIENCES<sup>1</sup>

By Dr. W. W. CAMPBELL

UNIVERSITY OF CALIFORNIA

ONE year ago, our committee on program and arrangements for the annual meeting of 1932 asked me, as the then new president, to deliver an address, of a specified length, at the annual dinner, and I did so. To the best of my knowledge, that was an innovation—a supplement to the prevailing type of dinner program. This year the committee repeated the invitation, perhaps largely because last year I respected the wisely specified time limit, with three minutes to spare. But I have a purpose in these preliminary remarks. As two points fix the direction of a straight line, so two presidential addresses in successive years may go far in establishing a custom. Fortunately, the membership of the academy is highly individualistic, and is always ready and quick to express its views. I need say no more.

It was gratifying, last week, to observe that the deep depression in the curve representing the recent course of financial and economic events in our coun-

<sup>1</sup> Address of the president at the annual dinner of the National Academy of Sciences, Washington, D. C., April 25, 1933.

try is apparently not matched by a similar depression in the curve depicting the output of new knowledge, achieved through research, in the domain of the physical and biologic sciences. The number of papers offered for the program of this week's meeting was uniquely large, and to accommodate them it was found necessary to hold duplicate sessions, one in this auditorium and the other in the lecture room, on all our four half days, as you will have observed. The high quality of the papers anticipated from the authors' names has been amply confirmed in their reading. These facts in relation to the academy's program are, I believe, in accord with the advance in knowledge made in our nation, as a whole, through research, as indicated by papers and volumes, rich in contents, published in the last year or two. I take special delight in adding that we have been extremely fortunate in the qualities of the papers presented in response to personal invitations issued to several guests by the academy's committee on program: Professor Vegard, professor of physics in the University of

Oslo, Professor Swann, director of the Bartol Foundation for Research in Physics, Philadelphia, Dr. Allison, head professor of physics in the Alabama Polytechnic Institute, Dr. R. H. Fowler, professor of mathematical physics in Cambridge University, and Dr. F. E. Matthes, of the U. S. Geological Survey; and I tender them this more comprehensive expression of the academy's gratitude than was possible in the several sessions. We are likewise deeply indebted to our former president, Professor Thomas Hunt Morgan, of the California Institute of Technology, for his admirable lecture of last evening.

I have been speaking of research activities and research results of the present and of the recent past; but what of the future, even of the immediate future? They threaten to be very different. A condition of intense anxiety on this subject exists in nearly all our universities, in the research institutions, in the learned societies in general, in the research organizations supported by the government of the nation, and with countless thousands of public-spirited and wide-awake citizens who have a fair comprehension of what scientific discovery, through experimentation and research, has done for humanity. In many universities, especially state universities, where research, sympathetically nurtured and supported through the years, has brought forth new knowledge of tremendous importance to the welfare of the nation, the degree of existing anxiety as to what may happen can be said to have approached, here and there, the stage of fear. The legislatures of the majority of our states are now in session, and they have the duty of appropriating funds for the support of their respective educational institutions through the next two years. The attitude of many, perhaps nearly all, of the legislatures toward research at public expense may fairly be described as unsympathetic and, in some cases, I am informed, as severely hostile. I need not say to this audience that a university, shorn of its research activities and deprived of the scholarly atmosphere that research develops, will eventually differ but little in character from what we may call a higher high school. The name "university" will remain, but the qualities special to a real university will dwindle and disappear. The Book of Great Wisdom, tried and proved through the centuries, says that "Where there is no vision, the people perish." Equal confidence may be placed in the thesis, "Where there is no research, the universities perish." The governments, the universities and the peoples in Europe and in many other parts of the world understand this principle perfectly. The universities in those countries, with few exceptions, are national, or state, or municipal universities, financially supported in major degree by their governments.

No American citizen in possession of his senses questions for a moment the absolute need for reduced appropriations. Wisdom in the immediate present, and our welfare, both our public and our private welfare, in the future, demand the prompt balancing of budgets—national, state, county, municipal budgets, and personal budgets as well; and all good citizens are ready to lend their approval to proposals for reductions made circumspectly and in accord with the inherent needs and the inherent merits of the services that would be thereby affected.

There is a large amount of valuable research now conducted, under the government, in the city of Washington, or with Washington as its administrative center. It is, for the most part, work that the states and the universities—both the state universities and the private universities—in their happiest days, and the research institutions existing and actively operating in this country, could not undertake, for reasons partly financial and for other extremely important and vital reasons that are not financial. For example, how could the state of Nevada or Colorado or Tennessee or Vermont undertake to contribute, individually, to the plans now being carried out by the U. S. Coast and Geodetic Survey? The investigational work conducted by our government is more or less in parallel with, but not unnecessarily duplicating, research activities supported on a large scale by the government of Great Britain, including Canada and the other dominions, the government of France, the government of Germany, the government of Italy and the governments of many of the other and smaller nations. The financial support of our national government for the researches in Washington and elsewhere in the United States has been obtained, for the most part, upon the basis of need and merit, and not at all by political log-rolling, not to any extent whatsoever by the threats of an "organized minority," tacit or vocal, to the effect that the congressman or the senator who does not vote the financial support asked for will be defeated at the next election. The researches referred to are conducted, it is absolutely unnecessary for me to say, by able, conscientious men who spent many years and much money in their later 'teens and their early twenties preparing in colleges and universities and graduate schools, many of them in England, France or Germany, to do this work—in fact, devoting several decades of each of their precious lives to fitting themselves for carrying on their present investigations. Many of the research organizations, under the government, to which they are attached, have had long and glorious histories; their high standards are being maintained; and their accomplishments continue to be valuable in commendable and worthy degree. At this point I must



say that I am in possession of no knowledge that would justify me in thinking, for one moment, that any executive officer of the government is proposing or intending to cut appropriations for the support of existing research activities in unjust or catastrophic degree. It is difficult for me to anticipate or fear that arbitrary cuts will be made, in the course of the conscientious governmental administration of our country, even though the power so to proceed unquestionably exists.

The Act of Incorporation of the National Academy of Sciences, adopted by the Congress and approved by President Lincoln in the year 1863, makes the academy an official agency of the government, as expressed in the following language, quoted from the act: "... the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject in science . . . , but the Academy shall receive no compensation whatever for any services to the Government of the United States." When an American citizen, necessarily a successful scientist, accepts election to membership in the academy, he tacitly agrees to heed every such summons, and to serve his government to the best of his ability, in the manner described, and without expectation or hope of receiving compensation. The academy has responded many times, and promptly, to the government's call, and it welcomes such duty.

If this address should happen to be published—this may or may not be the case—there would be opportunity to read the passage just quoted from the Act of Incorporation, and to comprehend better its significance. The reader could not fail to observe the limitations imposed upon the academy's freedom of action. The connection between the government of the nation, on the one hand, and the National Academy of Sciences, on the other, is not in the nature of a broad avenue with lines of trees and a strip of lawn in its center and a roadway on either side. It is rather a street, and it is not for me to say how wide is that street. The specification reads that "the Academy shall, whenever called upon by any department of the Government," and this corresponds to the definition of a one-way street.

In this connection a few very special things should be said, and even emphasized. Here I am speaking as a member of the academy, and not in commitment of the academy to any views or policies—I have not that authority or power—but in the light of my membership and experiences and observations in relation to the academy extending back through thirty-one years.

(1) The academy is composed of 265 members, whose chief interests throughout their lives have

resided in the natural sciences and the biologic sciences. They have all had wonderful opportunities—in many cases opportunities of their own making—to advance human knowledge in their several fields, through research and discovery, and they have been successful in their quest for the truth; otherwise, they would not be members of the academy. They are men (and two women) of strong character who have found happiness and satisfaction in their work. They have extended knowledge and, in many cases, have applied new knowledge to the daily affairs of the world, all with incalculable advantage to the human race. On such questions as government appropriations they have no "axes to grind." Their judgment would be devoid of self-seeking and, after due consideration of the facts, wholly in accord with the public welfare.

(2) The academy's interest in scientific research, of high merit, whether conducted in universities, research institutions or under government auspices, is very deep; but the academy would not and could not give its support to pseudo-research—that is, research in name that is not research in fact.

(3) The academy could not by any possibility lend its moral support to poor or faulty or uninspiring systems of research administration, or to systems or plans financially extravagant.

(4) I can not doubt that the academy would hold to the view that existing organizations, or their substitute organizations in other departments, charged with responsibility for the conducting of research, should be prepared to accept such reasonable subtractions from their financial resources as are based upon the thorough consideration of all elements involved.

I am not called upon to set forth here, of all places in the United States, and especially before this audience, the importance of research, the incomparable values of its accomplishments, the need for its continuance in strength diminished in no greater degree than is unavoidable. In my opinion, the products of research and invention in the domain of the physical and biologic sciences have been more potent in advancing the state of civilization on the earth from its low level of the fifteenth century to its high level in the twentieth century than have all other forces combined. I do not expect universal acceptance of this thesis, but I am prepared to defend it. There is no question that many other forces, both idealistic and practical, have been exceedingly influential and powerful in behalf of the nations and their peoples, but in the main those forces would not have existed, or certainly could not have operated, if the physical and biologic sciences had not provided the mental

and moral attitudes, the opportunities, the open sesame that permitted them to go out into the great world and exert their effective and beneficent influences.

Neither is there need for saying to this audience that the desirable cultivation of the fields of knowledge represented in the research activities of universities and governments has been but little more than begun. Our great commercial organizations recognize this fact in the existence of their research departments. They know that the discovery of fundamental knowledge and the application of the finest methods of scientific research are the essential and powerful aids to industrial progress. These commercial organizations control and apportion the appropriations in support of their several departments of activity and endeavor with rare acumen and judgment, and we

shall not learn that any of those organizations, successful in large degree, will reduce their financial support of research for the year beginning on July 1, 1933, in percentages exceeding those relating to their administrative divisions. Their boards of trustees are too wise for that. I do not know of any good reason why research activities conducted in universities and under governments should not be supported in accordance with the same policy. We know that such research activities have earned and paid priceless dividends through the years, the decades and the centuries of the past, and I do not have the slightest lack of confidence in the correctness of the thesis that further research activities, continued through the years, the decades and the centuries ahead, will be equally fruitful in results that the human race should have and will use to its tremendous advantage.

## A HISTORY OF THE NATIONAL RESEARCH COUNCIL 1919--1933

### IV. DIVISION OF CHEMISTRY AND CHEMICAL TECHNOLOGY<sup>1</sup>

By Professor CHARLES A. KRAUS

CHAIRMAN

THE Division of Chemistry and Chemical Technology is a representative organization of American chemists. Its membership in the main consists of representatives from the different societies of American chemists and members-at-large nominated by the division itself. In addition, it acts through numerous committees, the membership of which is unrestricted. The division is, therefore, under the control of American chemists acting through representatives chosen by their own organizations.

Its chairmanship has been held by the following persons since the organization of the division in 1918:

1918 —John Johnston  
1919-1920—W. D. Bancroft  
1920-1922—F. C. Cottrell  
1922-1923—E. W. Washburn  
1923-1924—J. Enrique Zanetti  
1924-1925—James F. Norris  
1925-1927—William J. Hale  
1927-1928—Frank C. Whitmore  
1928-1929—George A. Hulett  
1929-1930—James E. Mills  
1930-1931—Harry A. Curtis  
1931-1932—Henry K. Benson  
1932-1933—Charles A. Kraus

The division acts as agent in cooperation with other

<sup>1</sup> This is the fourth of a series of ten articles prepared to describe briefly the nature of the activities with which the National Research Council has been engaged during the past fourteen years.

similar national agencies on all problems of international concern. It recommends the appointment of delegates to the International Union of Chemistry, votes on matters requiring decision *ad interim*, receives and distributes reports of committees of the union, and assists in organizing American committees supplementary to committees of the union. In a field such as chemistry there are many questions that can be settled only by international agreement. The division, owing to its wide affiliations, is in a position to give expression to the opinions of American chemists.

Following the war, there was great need for reliable values of physical and chemical constants. Indeed, a thoroughly satisfactory tabulation of such constants had not theretofore been made. At the request of the International Research Council, the Division of Chemistry and Chemical Technology, acting conjointly with the Division of Physical Sciences, undertook the stupendous task of publishing "International Critical Tables of Physical and Chemical Constants." The publication of these tables entailed the critical examination of the vast amount of data collected in the literature up to that time. The division organized an editorial staff, including ten foreign representatives; and arranged for the detailed analysis of all available data by collaborating experts in the various fields. The first volume of the Tables appeared in 1926 and the seventh volume in 1930. These seven volumes totaled 3,404 pages.



One of the defects of practically all existing tables of constants has been the lack of satisfactory indexes. The division accordingly undertook to provide an index to the Critical Tables. This index, comprising some 330 pages, will appear from the press in April of the present year.

The "Survey of American Chemistry" was brought out in 1926, in order to provide a general view of the state of research progress in America. This survey developed into an annual publication, the seventh volume of which is now in press. Chapters dealing with various fields of chemistry are contributed by authors who themselves are active in those fields. Originally all fields were reviewed each year, but with the last volume of the Survey it was decided to review some fields only every second or third year. To any one who is interested in following the development of research in chemistry generally throughout the country, the Survey has proved very helpful.

The division has been of assistance in providing avenues for publication of important results in many different ways. Various chairmen of the division have contributed monographs on timely subjects, journal publications have been assisted, and reports of numerous committees have been made available. The division was helpful in establishing *The Chemical Review*, a bi-monthly journal, and there might also be named the Chemical Monograph Series, which now comprises some 50 volumes.

The division, through various committees, has administered research funds provided for special investigations. Among these may be mentioned the investigation carried out at the Bureau of Standards on the preservation and permanence of records. As the result of this investigation it has been found that the life of all record papers is greatly influenced by conditions such as light, humidity and atmospheric impurities. Corrective measures have been suggested and libraries are already making use of the results of this investigation. This work has also done much to stimulate further investigation of problems relating to the permanence of record papers. Important investigations were also carried out under the auspices of the Committee on Chemical Research on Medicinal Substances, with funds provided for the purpose from various sources. The division also cooperated with the Central Petroleum Committee in organizing petroleum research under a grant of \$500,000, which was administered by the Petroleum Institute.

Much of the work of the division is carried out through its committees, the membership of which includes not only members of the division but also chemists throughout the country.

The Committee on the Chemistry of Colloids was organized in 1919 and has ever since been active in

promoting colloid research. This committee was instrumental in arranging for the publication of several books and of numerous monographs, the earliest of which were published in mimeographed form by the National Research Council. In 1923 the committee was instrumental in organizing the First Colloid Symposium. This symposium has since been continued each year in cooperation with the Colloid Division of the American Chemical Society. The papers read at these symposia have been published in monograph form.

The Committee on Contact Catalysis was organized in 1920. Its first report was published in the *Journal of Industrial and Engineering Chemistry* in 1921, and subsequent reports have been published each year in the *Journal of Physical Chemistry*.

The Committee on Photochemistry was organized in 1927, and has published reports in the *Journal of Physical Chemistry*. The Committee on the Construction and Equipment of Chemical Laboratories was organized in 1924. Its final report was published in book form by the Chemical Foundation in 1930. This committee has been reorganized and is continuing its work in collecting data relating to laboratory construction and equipment. The Committee on Explosives Investigation was very active and rendered much valuable service for some years following the war. Among its other activities, it carried on a study of the utilization of surplus military explosives, and prepared a descriptive list of hazardous chemicals and explosives. The Committee on Research Chemicals was active for a number of years following the war, collecting data on research chemicals available in this country. Lists of research chemicals were published in the Reprint and Circular Series of the National Research Council.

Other committees, such as the Committee on Pharmaceutical Research, on Methods of Organic Analysis, on Medicinal Substances and on Petroleum Chemistry, have been active in stimulating research. The Committee on Chemical Research on Medicinal Substances was formed in 1923. It continued until its functions were taken over by the Annual Survey of American Chemistry, after its members had published 144 papers and three United States patents. Research results valued at many millions of dollars have been credited to the activities of this committee. The Central Petroleum Committee was constituted in 1926 with the cooperation of the Divisions of Physical Sciences and Geology and Geography, to plan a research program on the chemistry, physics and geology of petroleum, in conjunction with the American Petroleum Institute. This program has contained 41 separate projects, some of which have been completed, while others are still active.

Each year as funds permitted the division has undertaken conferences for the initiation and coordination of chemical research. Such conferences have been held on the subjects of permanence of printed records, on the coordination of chemical literature, on biological nomenclature, and on farm waste and chemistry of soils. The results of these meetings have been intangible in part, but the mere bringing together of eminent men interested in a certain phase of chemistry is important.

The division has from time to time collected pertinent data relating to chemistry. Since 1922, the division has each year made a census of graduate students in chemistry throughout the country, and this census has been published in the journals. The division also conducted a study of conditions of chemical research in the Southern States. The report of this study was published by the Chemical Foundation. Other activities include cooperation between academic and industrial research, and a list of research problems in various fields of chemistry.

One of the important activities of the division has been the administration of the grants in aid of re-

search. During the past four years 42 grants have been made to 37 individuals. Many papers have been published as a result of these grants and many capable research workers have been encouraged in their work. Particularly during the last few years, the grants-in-aid have proved invaluable to research workers who have found themselves handicapped through lack of funds.

Another important activity of the Research Council and of the Division has been in connection with the National Research Fellowships. Since their foundation, 257 fellowships in chemistry have been awarded to 150 individuals. While it is true that some will profit more than others from the opportunities afforded by these research fellowships, there can be no question that the National Research Fellowships have produced tangible results.

Through meetings of the division and of committees, and through other contacts afforded by the division, those interested in various fields of chemistry are brought together and contacts are established. It is from these contacts that we may expect some of the major benefits in the course of time.

## SCIENTIFIC EVENTS

### CHICAGO PROGRAM ON RADIATION AND PLANT LIFE

THE American Society of Plant Physiologists has joined with Sections G and O and their affiliated organizations in the programs of June 20 and 21. On the morning of June 22, however, a special symposium has been arranged for plant physiologists who are attending the meetings. The meeting will be held in the Civic Opera Building, Chicago, in the rooms of the Lighting Institute at 10:00 A. M. The meeting will be open to all visiting botanists and to professional growers of plants. The titles of the papers are as follows:

"Influence of Radiation on  $\text{CO}_2$  Absorption by Plants": W. H. Hoover, Smithsonian Institution.

"The Interrelated Effects of Light and Temperature on Plant Growth": A. D. Davis, University of California.

"Growth as a Criterion for Physiologic Response to Radiations": E. S. Reynolds, Missouri Botanic Garden.

"Photoperiodism and its Practical Application to Greenhouse Crops": Alex Laurie, Ohio State University.

"Responses of Certain Plants to Artificial Radiation Factors Applied as Supplements to Daylight": R. B. Withrow, Purdue University.

"The Response of Greenhouse Plants to Electric Light Supplementing Daylight": Laurenz Greene, Purdue University.

"Experimental Work at Pennsylvania State College

on Radiation as Applied to Plants": H. W. Popp, Pennsylvania State College.

"Chemical Responses of Certain Plants to Solar Ultra-violet Radiation": W. E. Tottingham, University of Wisconsin.

"Some Growth Responses of Plants to X-ray Treatments": C. A. Shull, University of Chicago.

The program will be continued in the afternoon, if necessary, followed by a round table discussion.

CHARLES A. SHULL

### MATHEMATICS AT THE CHICAGO MEETING

THE preliminary program of the Chicago meeting of the American Association for the Advancement of Science and Associated Societies, printed in the issue of *SCIENCE* for May 19, contains information concerning the programs of the different sections, but it may be well to repeat here a summary of the plans of the mathematicians given in the announcement of the American Mathematical Association.

It reports that the American Association and associated societies will present unusually attractive programs in connection with the Century of Progress, the week of June 19 being devoted chiefly to pure science and the next week to applied science. There will be numerous addresses by prominent foreign scientific men who have been specially invited for



these meetings. These programs and the many interests offered at the Century of Progress exposition add unusually attractive features to our usual pleasant summer meetings.

The society will hold a session on Tuesday afternoon in Mandel Hall at which Professor Tullio Levi-Civita, of the University of Rome, will speak on "Some Mathematical Aspects of the New Mechanics," and Professor G. D. Birkhoff, of Harvard University, will speak on "Quantum Mechanics and Asymptotic Series." At a symposium at ten o'clock Wednesday morning in Mandel Hall, Professor Lipót Fejér, of the University of Budapest, will speak on "The Infinite Sequences Arising in the Theories of Harmonic Analysis, of Interpolation, and of Mechanical Quadratures," this to be followed by addresses by Professor C. N. Moore, of the University of Cincinnati, "On the Use of Cesàro Means in Determining Criteria for Fourier's Constants," and Professor Dunham Jackson, of the University of Minnesota, on "Certain Problems of Closest Approximation." A second symposium will be held at two o'clock on Wednesday in the Italian Building on the Fair Grounds; addresses will be given by Professor Levi-Civita on "Nets on a Surface and Extension of Trigonometry," by Professor W. C. Graustein, of Harvard University, on "Invariant Methods in Differential Geometry," and by Professor Enrico Bompiani, of the University of Rome, on "Deformations of Higher Species of Surfaces and Manifolds." At two o'clock on Friday, in Eckhart Hall, an address will be given by Professor L. E. Dickson, of the University of Chicago, on "Recent Progress in Additive Number Theory," following which there will be a session of short papers on number theory. Sessions for the reading of short papers will be held on Monday afternoon and Thursday and Friday mornings.

Among the addresses of the week by physicists will be the following: At 4:30 Tuesday, at the Fair Grounds, Dr. Bjerknes, Geophysical Institute, Bergen, Norway, on "Atmospheric Soundings, Methods and Results"; at 4:30 Wednesday, in the Italian Building, Enrico Fermi, University of Rome, on "Theory of Hyperfine Structures"; at 8:00 P. M. Wednesday, place to be announced, Dr. F. W. Aston, University of Cambridge, on "The Story of Isotopes" and Dr. R. A. Millikan, California Institute of Technology, on "New Light on Nuclear Physics"; at 4:30 Thursday, in the Italian Building, Professor Niels Bohr, of the University of Copenhagen, on "Space and Time in Contemporary Physics." Other addresses by the visiting scientists will be announced in the current issues of SCIENCE.

The joint dinner of the mathematicians and their guests will be held on Friday evening at 6:30 at

Judson Court. On Monday evening the American Association and its associated societies will hold a general reception on the grounds of the Century of Progress. The American Association will hold a dinner on Thursday evening at which the visiting scientists will be guests.

#### CHEMISTRY AT THE CHICAGO MEETING

ACCORDING to an announcement sent out by the American Chemical Society, joint sessions with the sections of the medical sciences, physics and geology and geography of the association have been arranged by the Section of Chemistry, of which Professor Arthur B. Lamb, of Harvard University, president of the American Chemical Society, is chairman.

Professor Francis W. Aston, of the University of Cambridge, England, Nobel prize winner in chemistry for 1922, and Professor The. Svedberg, of the University of Upsala, Sweden, Nobel prize winner in chemistry for 1926, will head a contingent of foreign chemists who will take part.

Professor Aston and Professor Robert A. Millikan, of the California Institute of Technology, Nobel prize winner in physics for 1923, will deliver addresses at a public meeting Wednesday night, June 21. Professor Aston will speak on "The Story of Isotopes," a subject which has thrown new light on the structure of atoms, building blocks of the universe, and Professor Millikan will discuss nuclear physics.

American chemists from universities and government and industrial bureaus of research will detail advances in the application of mathematics to chemistry's problems and gains in chemistry's war on disease.

Two recipients of the Langmuir Medal of the American Chemical Society, annually awarded to the young chemist who shows most promise of achievement, will present papers. They are Professor Linus Pauling, of the California Institute of Technology, first medal winner, and Dr. Oscar K. Rice, of Harvard University, second medal winner. Dr. Henry Eyring, of Princeton University, who was awarded the prize of the American Association for the Advancement of Science for 1932, will also participate.

A symposium devoted to the earth's age will bring together the sections of chemistry, physics and geology and geography on Wednesday afternoon, June 21, at two o'clock in Rosenwald Hall. The secretary of the section is Professor J. H. Simons, of Northwestern University.

Because of the importance of chemistry to medicine, the Section of Chemistry will meet jointly with the Medical Section on Monday morning, June 19, at 9:30 o'clock in Thorne Hall for a symposium on the relation of colloid chemistry to biological problems.

Professor Svedberg, who won the Nobel prize for his work in colloid chemistry, will describe a new investigation into the sedimentation constants and molecular weights of the respiratory proteins. Professor Filippo Bottazzi, Istituto di Fisiologia, Naples, and Professor W. J. V. Osterhout, Rockefeller Institute for Medical Research, will address the session.

The subject of a third symposium, to be held at the International House on Wednesday morning, June 21, with the Chemistry and Physics Sections jointly participating, will be "Isotopes." Professor Aston, who received the Nobel prize for his work in isotopes, will give measurements of the relative abundance of isotopes.

Quantum mechanics in chemistry will be discussed at a symposium of the Chemistry and Physics Sections and the American Physical Society, Tuesday morning, June 20, at 9:30 o'clock in the International House. The speakers will include Professor J. C. Slater, of the Massachusetts Institute of Technology; Professor Pauling; Dr. Eyring, of Princeton University, and Professor R. S. Mulliken, of the University of Chicago.

Many chemists are expected to attend the joint session of the Section of Physics and the American Physical Society on Friday morning at 9:30 o'clock in the International House, which will be devoted to the breaking down of matter. The speakers include: Dr. J. D. Cockroft, of the University of Cambridge; Dr. M. A. Tuve, of the Carnegie Institution; Professor W. D. Harkins, of the University of Chicago, and Professor E. O. Lawrence, of the University of California.

The dinner of the Chicago Section of the American Chemical Society, in conjunction with the Section of Chemistry of the association, will be held on Friday night, June 23, at the Midland Club. Professor Svedberg will deliver the principal address, "The Sedimentation of Molecules in Centrifugal Fields," at a supplementary meeting in the Field Museum. A luncheon of the Chicago Chemists Club and the Section of Chemistry of the association will be held on Tuesday, June 20, at 12:30 o'clock in the International House. Brief informal and non-technical talks will be made.

#### THE MEDICAL SCIENCES AT THE CHICAGO MEETING

THE *Journal* of the American Medical Association reports that at the summer session of the American Association for the Advancement of Science in Chicago, June 19-23, Section N (the medical sciences) will sponsor four symposiums and a public meeting. Headquarters will be at the Knickerbocker Hotel. Monday morning, June 19, the section will join with Section C (chemistry) at Thorne Hall, Northwestern University, for a symposium on colloid chemistry as

related to biologic problems, with the following speakers:

Dr. Edwin J. Cohn, Harvard Medical School, Boston, "Electrostatic Forces in Systems Containing Biological Components"; Professor Theodor Svedberg, Upsala University, Sweden, "Sedimentation Constants and Molecular Weights of the Respiratory Proteins"; Professor Filippo Bottazzi, Naples, Italy, "Physicochemical Properties of Concentrated Blood Serum."

Tuesday morning, June 20, Section N will combine with Section F (zoology) in a symposium with the following speakers:

Professor Archibald V. Hill, London, England, "Physical and Chemical Changes in Nerve During Activity"; Dr. Wallace O. Fenn, University of Rochester, "Nerve Respiration"; Dr. Ralph W. Gerard, Chicago, "Chemical Activity of Nerve"; Dr. Herbert S. Gasser, New York, "Electric Phenomena in Nerve."

Wednesday morning a symposium on pathologic physiology will be held at Northwestern University, in which the following will participate:

Dr. William H. Park, New York, "B C G Vaccination"; Dr. Charles H. Best, Toronto, "Fatty Changes in the Liver of Normal and Diabetic Animals"; Dr. Arthur L. Tatum, Madison, Wisconsin, "Morphine Addiction and Morphine Tolerance"; Dr. Maurice B. Strauss, Boston, "Etiology of Pernicious Anemia and the Related Macrocytic Anemias."

Thursday morning, June 22, a surgical-endocrinologic symposium will be presented at Northwestern University by the following:

Dr. George W. Crile, Cleveland, "A Century of Progress in Surgery: Anesthesia, Antisepsis and Asepsis, Shock and Careful Handling of Tissues"; Dr. Max Ballin, Detroit, "Clinical Recognition and Surgical Treatment of Parathyroidism"; Dr. Percival Bailey, Chicago, "Surgical Control of Hypophyseal Disorders"; Dr. John deJ. Pemberton, Rochester, Minnesota, "Recent Developments in the Clinical Recognition and Surgical Management of Hyperfunction of the Thyroid Gland"; Dr. Evarts A. Graham, St. Louis, "Clinical Recognition and Surgical Management of Hypoglycemia Produced by Tumors of the Islets of Langerhans."

It is expected that Madame Marie Curie, Paris, co-discoverer of radium, will address some of these meetings.

A public meeting celebrating a century of progress in medicine will be held Tuesday evening, June 20, in Thorne Hall. The program arranged is as follows:

Dr. Morris Fishbein, Chicago, editor, the *Journal* of the American Medical Association, "Frontiers of Medicine"; Dr. Paul Dudley White, Boston, "Heart Disease"; Dr. Max Cutler, Chicago, "The Conquest of Cancer."



### THE AMERICAN SOCIETY AND JOURNAL FOR PHARMACOLOGY AND EXPERI- MENTAL THERAPEUTICS

THE annual meeting of the society was held at the University of Cincinnati from April 10 to 12. The following officers were elected for next year:

President, Wm. de B. MacNider  
Vice-president, A. L. Tatum  
Secretary, V. E. Henderson  
Treasurer, O. H. Plant  
Council, C. M. Gruber  
G. B. Roth  
Membership Committee, J. Auer

The most important business before the society was the offer of Dr. J. J. Abel, who founded the *Journal of Pharmacology and Experimental Therapeutics* and who, with Dr. Carl Voegtlin and Dr. Reid Hunt, formed the original corporation, to turn over the journal to the society as its official organ. This offer was unanimously accepted by the society, and the following resolution was adopted by the society as the means of expressing its appreciation to Professor Abel:

*Be it Resolved*, that the Secretary of the Society for Pharmacology and Experimental Therapeutics be instructed to write to Professor Abel and to the members of the Corporation of the *Journal of Pharmacology and Experimental Therapeutics*,

(a) That the Society wishes to express to them its deep gratitude and thanks for their most gracious and very generous offer to transfer the Journal free of all encumbrances to the Society.

(b) That the Society records its grateful appreciation of Dr. Abel's long and faithful service in furthering the advancement of Pharmacology in this country by promoting and editing the Journal.

(c) That the Society wishes to assure Dr. Abel that every effort will be made to maintain and extend if possible, the high standards of excellence as set by the Journal during the twenty-four years it has been under his control.

(d) That the Society is deeply touched by the devotion shown by Dr. Abel to its interest in returning from Baltimore to this meeting in order to aid in completing the arrangements for the transfer of the Journal to the Society.

The necessary steps were taken by the society for giving effect to this transfer.

V. E. HENDERSON,  
Secretary

### OBITUARY

DR. EDGAR HENRY SUMMERFIELD BAILEY, professor emeritus of chemistry at the University of Kansas, where he was a member of the faculty for fifty years, died on June 1 at the age of eighty-four years.

PROFESSOR WILLIAM P. RYAN, head of the department of chemical engineering at the Massachusetts Institute of Technology and director of its school of chemical engineering practice, died on May 31 at the age of thirty-eight years.

FREDERIC POOLE GORHAM, professor of bacteriology at Brown University, died suddenly on June 4. He was sixty-two years old.

## SCIENTIFIC NOTES AND NEWS

WE are informed by cable that there was organized in London on June 1 the Academic Assistance Council with Lord Rutherford as chairman. Its object is to provide positions or other aid for university professors and scientific men who because of "religion, political opinion or race are unable to carry on their work in their own country."

DR. ISAAH BOWMAN, director of the American Geographical Society, has been elected chairman of the National Research Council, to fill the position occupied until his recent resignation by Dr. Vernon Kellogg. Dr. Bowman will remain director of the American Geographical Society and will devote half his time to the work of the National Research Council. There has been created in the National Research Council the office of honorary vice-chairman to which Dr. William H. Welch, of the Johns Hopkins University, has been elected. The honorary chairman is Dr. George Ellery Hale, honorary director of the Mount Wilson Observatory.

DR. HAROLD WILLIS DODDS, professor of politics at

Princeton University and chairman of the administrative committee of the Princeton School of Public and International Affairs, has been elected fifteenth president of the university to succeed the late Dr. John Grier Hibben. Dr. Luther P. Eisenhart, professor of mathematics and dean of the faculty, has been elected dean of the Graduate School to succeed Dr. Augustus Trowbridge, who resigned last year, and Dr. Robert Kilburn Root, Woodrow Wilson professor of literature and chairman of the department of English, succeeds Dr. Eisenhart as dean of the faculty. Since the resignation of Dr. Hibben in June, 1932, Edward D. Duffield, president of the Prudential Insurance Company and trustee of the university, has been acting president.

DR. GEORGE DAVID BIRKHOFF, professor of mathematics at Harvard University, has been elected Perkins professor of mathematics to succeed Professor William F. Osgood, who on September 1 retires with the title of professor emeritus.

PROFESSOR WILLIAM H. TALIAFERRO, associate dean

of the Division of the Biological Sciences at the University of Chicago, has been appointed chairman of the department of hygiene and bacteriology to succeed Dr. Edwin O. Jordan, who retires on October 1 after being associated with the university for forty-one years.

DR. SIMON FLEXNER, director of the Rockefeller Institute for Medical Research, was the speaker on June 1 at a luncheon at the Bankers Club, given in his honor by the Bond Club of New York.

THE Dutch Red Cross Society, under the presidency of Prince Hendrik, awarded its gold medal on April 19 to Dr. Karl Landsteiner, member of the Rockefeller Institute for Medical Research, for his discovery of the blood groups in relation to blood transfusion.

THOSE on whom honorary degrees are to be conferred by the University of Cincinnati on June 10 include Professor Herman Schneider, dean of the College of Engineering and formerly president of the university; Dean Roseoe Pound, of the Harvard Law School, and John Adam Fleming, director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington.

DR. WILLIAM DE BERNIERE MACNIDER, Kenan research professor of pharmacology at the University of North Carolina Medical School, on May 30 was awarded the honorary degree of doctor of science during the commencement exercises closing the ninety-fifth session of the Medical College of Virginia, Richmond.

DR. HUGH H. YOUNG, clinical professor and visiting urologist at the Johns Hopkins Hospital, will sail on June 20 to receive the honorary degree of doctor of philosophy from Queen's University, Belfast, Ireland.

SIR WALTER MORLEY FLETCHER, secretary of the British Medical Research Council, and Dr. Samuel Smiles, Daniell professor of chemistry at King's College, University of London, will receive the degree of D.Sc. from the University of Belfast.

PROFESSOR HENRY B. WARD, who is retiring as professor of zoology and head of the department of zoology at the University of Illinois, was given a "surprise party" at his home on the evening of May 27. Seventy of his colleagues and friends were there and presented him with a canoe and boat house, and a volume of letters from one hundred and twenty-five friends and associates. Professor Ward has become permanent secretary of the American Association for the Advancement of Science under conditions which permit him to continue research work.

BOSTON surgeons and members of the Italian Medical Society on June 3 paid tribute to Dr. Alberto Alessandri, professor of surgery at the University

of Rome, at a dinner given in his honor at the University Club. Dr. Alessandri is in Boston as part of his tour of the country, during which he is studying American hospitals and surgical methods.

DR. ERNEST E. IRONS, dean of the Rush Medical College, has been appointed chairman of the department of medicine at the University of Chicago, succeeding Dr. George F. Dick. Dr. Dick continues as professor in the department of medicine at the college and as professor and chairman of the department of medicine in the Division of Biological Sciences of the University of Chicago.

OWEN STANLEY GIBBS, professor of physiology and pharmacology, University of Georgia School of Medicine, has been appointed professor of physiology at Georgetown University School of Medicine, Washington, D. C.

DR. ISIDOR MORRIS HEILBRON, at present Heath Harrison professor of organic chemistry in the University of Liverpool, has accepted an invitation to a chair of organic chemistry in the University of Manchester.

MR. ROBERT RAE, of Queen's University, Belfast, has been appointed to the professorship of agriculture at the University of Reading, in succession to Professor S. Pennington.

THE chair of physiology at Edinburgh University, which becomes vacant on September 30 of this year by the retirement of Sir Edward Sharpey-Schafer, has been filled by the appointment of Dr. Ivan de Burgh Daly, professor of physiology in the University of Birmingham.

At the University of Dublin Sir Charles Arthur Kinahan Ball has become the Regius professor of surgery in succession to the late Sir William Taylor, and John Purser has been appointed to the chair of civil engineering, which had become vacant by the death of Professor David Clark. Mr. Purser is assistant professor of civil engineering at the City and Guilds (Engineering) College and reader in civil engineering in the University of London.

DR. WALTER J. WILLIAMS, of Baylor University, Waco, Texas, was recently appointed curator of the university museum. The death of John K. Strecker, who had held this position since 1903, occurred on January 9. Dr. Williams had been closely associated with him since 1924.

DR. DANIEL F. JONES, who is a member of the board of overseers of Harvard College, has been elected president of the American Surgical Association.

PROFESSOR GEORGE H. PARKER, director of the zoo-



logical laboratories of Harvard University, was chosen on May 29 *president* of the Harvard Chapter of Sigma Xi for the coming year; Dr. James B. Conant, the newly elected president of the university, was elected *vice-president*; Professor Kirtley F. Mather, *secretary*; Dr. L. Don Leet, *assistant secretary*, and Professor William L. Crum, *treasurer*.

DR. ALEXANDER WETMORE, assistant secretary of the Smithsonian Institution, has been elected president of the District of Columbia Chapter of Sigma Xi.

THE following have been elected as officers of the Chicago Chemists Club for the year 1933-34: *President*, Gustav Egloff; *First vice-president*, E. C. Leamon; *Second vice-president*, C. O. Miller; *Secretary*, C. D. Lowry, Jr.; *Treasurer*, E. A. Dieterle, and *Trustee*, Bruce K. Brown.

At the annual general meeting of the Royal Geographical Society, London, to be held on June 19, the council will propose the election of Major-General Sir Percy Cox as president of the society in succession to Admiral Sir William Goodenough, whose term of office expires in November. Sir William will then become a vice-president. Sir Percy Cox has been a fellow of the society since 1895, was a vice-president in 1926 and is at present a member of the council.

PROFESSOR C. U. ARIENS KAPPERS, director of the Central Institute for Brain Research at Amsterdam, arrived in New York on May 29. He is a guest of the Century of Progress Exposition and the American Association for the Advancement of Science. After the meeting he is expected to give lectures in New York and Toronto. Dr. Ludwig Diels, director of the Botanical Garden and Museum at Berlin, also a guest of the exposition and the association, arrived on April 16. The *Bulletin* of the New York Botanical Garden states that he planned to spend a month in botanical exploration in the southeastern states, to visit Washington and Boston and to spend some time in New York before going to Chicago about the middle of June.

DR. ERNEST O. LAWRENCE, professor of physics at the University of California, will be visiting lecturer in physics at the summer session at Cornell University. Dr. Lawrence will give a course of lectures on "The Theory of Electric Discharges" and will conduct a discussion course dealing chiefly with "Nuclear Phenomena."

DR. ALFRED LANDÉ, professor of physics at the Ohio State University, delivered on May 26 the annual Sigma Xi address on "Determinacy in Physics and Biology" before the University of Cincinnati Chapter.

DR. D. B. DILL, of the Fatigue Laboratory, Harvard University, recently addressed the Massachusetts State College Sigma Xi Club on "Capacity for Work." On May 2 Dr. C. C. Little, of the Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine, addressed the club on "Recent Researches on Cancer."

THE officers of the "Notgemeinschaft der deutschen Wissenschaft" have presented their resignations. They include Dr. Friedrich Schmidt-Ott, formerly "Kultus" minister, president since its foundation; Dr. Walter von Dyck, professor of mathematics at the Munich Institute of Technology; Professor Fritz Haber, who recently resigned as director of the Kaiser Wilhelm Institute for Physical Chemistry, and Dr. Heinrich Konen, professor of physics at the University at Bonn, vice-presidents.

THE Pacific Science Congress opened at Victoria, British Columbia, on June 1, with 160 men of science from thirty nations bordering on the Pacific in attendance. Lieutenant-Governor J. W. Fordham Johnson welcomed the convention to British Columbia, and Dr. H. M. Tory, of Ottawa, president of the congress, responded. Among the speakers at the opening session were Professor Paul Chavier, of the Paris Academy of Sciences; Professor G. I. Taylor, of the Royal Society of London; Dr. S. Hatai, of the Imperial Japanese University, Tokyo; Professor G. Van Eferdingen, spokesman for the Netherlands Government, and Dr. H. E. Gregory, director of the Bernice P. Bishop Museum at Honolulu. On Monday, June 5, the entire group adjourned to Vancouver, B. C., where the meeting will continue until Wednesday, June 14. After the close of the congress, the members will take a four-day tour through the famous Canadian Rockies, to Calgary and return.

It has been found advisable to cancel the 1933 meeting of the National Conference on Weights and Measures which normally would be held early in June. After considering the entire situation the executive committee of the conference has decided by a unanimous vote that it would be unwise to attempt to hold a meeting this year. When the 1932 meeting was abandoned it was hoped that one could be held as usual in 1933, but continuance of abnormal economic conditions has made it certain that but few people would have been able to attend.

THE one hundred and first annual session of the British Medical Association will be held in Dublin, July 21-29. The annual representative meeting will begin Friday, July 21, and continue the next three week days. The annual general meeting will be held Tuesday afternoon, July 25, and the scientific sessions will occupy the next three days. Saturday,

July 29, will be devoted to excursions to places of interest. Dr. Thomas G. Moorhead, regius professor of physie, Trinity College, Dublin, is the incoming president of the association.

THE date of the meeting of the Phi Sigma Society is June 26, 27 and 28, not June 19, 20 and 21, as announced in the preliminary program of the Chicago meeting of the American Association.

THE fiftieth anniversary of the founding of the Wisconsin Agricultural Experiment Station was observed at the Farm Field Day in Madison on June 3. The Babcock film, a talking picture taken by the

U. S. Department of Agriculture while the late Dr. S. M. Babcock was still living, was shown for the first time to a Wisconsin audience. It shows Dr. Babcock in his laboratory explaining the test and the machine which he developed which is used generally wherever dairying is carried on. Dr. Eugene Davenport, formerly dean of the College of Agriculture of the University of Illinois, was the principal speaker. The departments of the College of Agriculture, carrying on research, arranged an exhibit to show recent developments and findings as they apply to practical every-day farm and home problems.

## DISCUSSION

### MEANINGLESS VERSUS SIGNIFICANT TERMS IN GEOLOGICAL CLASSIFICATION

IN the February 10, 1933, issue of *SCIENCE* there appears a brief article by Dr. M. M. Leighton on "The Naming of the Subdivisions of the Wisconsin Glacial Age," in which he proposes the substitution of certain meaningless terms—Tazewell, Cary and Mankato—for the significant terms, Early Wisconsin, Middle Wisconsin and Late Wisconsin, which have been in general use for considerable time, and are readily understood by any one reading geological literature, denoting as they do successive parts of the Wisconsin glacial stage. The incentive for suggesting the new names seems to have its basis in a newly acquired view of Dr. Leighton that the deposition of the Iowan drift came only a short time before that of the Early Wisconsin drift, and so it may properly be included in the Wisconsin stage.

Whether the Iowan should be so included, if the entire field is taken into account, is far from being clearly established. This has been made forcibly apparent in a recent report by Dr. W. C. Alden on eastern Montana and adjacent areas (Professional Paper 174, U. S. Geological Survey, issued in 1932). There are deposits in Montana and the Dakotas which Dr. Alden is inclined to refer to the Iowan, but he considers them too old to be included in the Wisconsin stage. These are discussed by him under the heading "Illinoian or Iowan." But he thinks they do not appear to be as old as the Illinoian of Illinois.

Inasmuch as the entire series of drifts classed as Illinoian, Iowan and Wisconsin fall in the last quarter of the Pleistocene Period the distinctions in age aspects are less striking than between these drifts and those of middle and early Pleistocene age, known as Kansan and Nebraskan. This being the case, it seems advisable to let the terms that are in general use stand, especially where they have significance, and are

self-explanatory, and not replace them by a set of meaningless terms.

FRANK LEVERETT

ANN ARBOR, MICHIGAN

### THREE PREHISTORIC PARASITES

IN 1916-17 an expedition of the Peabody Museum of American Archaeology and Ethnology of Harvard University excavated Basket-Maker Indian remains from desert caves in the northeastern portion of Arizona. Several human bodies were recovered and these have been described in the museum report<sup>1</sup> and elsewhere.<sup>2</sup>

Besides the human remains, two dogs were also found in undisturbed burial cists dug into the hard pan of the so-called "White Dog" cave. With the larger dog were found the bodies of many thousand flies. These flies were identified at the Museum of Comparative Zoology at Harvard as being *Caliphora coloradensis*.

Just recently a thorough microscopic examination has been made of uncontaminated skin and hair taken from the larger dog, and in a surprisingly well-preserved state have been found the eggs and young adults of a louse (*Trichodectus*), eggs and adults of a flea (*Sarcopsylla penetrans*), and numerous colonies of a fungus (*Trichosporum giganteum*) growing upon the hair shafts.

The only claim to fame of these insignificant parasites is their age, which has been conservatively estimated to be between six and ten thousand years.

GALE E. WILSON

SEATTLE, WASHINGTON

### THE DISTRIBUTION OF SERAPIAS HELLEBORINE IN CENTRAL NEW YORK

*Serapias Helleborine* L.—classified in the past as *Epipactis Crantz*; *E. latifolia* All.; *E. viridiflora*

<sup>1</sup> S. J. Guernsey and A. V. Kidder, "Basket-Maker Caves of Northeastern Arizona," Peabody Museum papers, Vol. viii, No. 2, 1921.

<sup>2</sup> G. E. Wilson, "A Study in American Paleohistology," *American Naturalist*, Vol. lxi, 1927.



Reichenb.—is believed to have been introduced from Europe. Its range was first reported in the immediate vicinity of Syracuse, New York, and later Buffalo, New York, and Toronto, Ontario. A more recent study shows it occupies a wider but limited range and is rare in each locality where found.<sup>1</sup>

Since *Serapias Helleborine* was first observed in the vicinity of Syracuse, the only region of the eastern United States where the hart tongue fern, *Scolopendrium vulgare*, grows, botanists suspected that its distribution would be limited to the same general areas. The orchid, however, has been a persistent invader of new areas in central New York, rapidly increasing as it adapts itself to the environment. Especially is this true in the Cayuga Lake Basin, where *Serapias Helleborine* was rare 15 years ago but to-day is a rather common plant, growing from roadsides to deep woods.<sup>2</sup> During the past year, 1932, this orchid has invaded in large numbers highly diversified areas both in natural and cultivated habitats in central New York. One of the areas invaded was a highly domesticated habitat in a residential district of Syracuse. This habitat, a heavy, sodded, well-kept residence lawn, supported seven vigorous plants approximately 2½ feet tall. These plants were growing in four unusual positions in the lawn, which saved them from the cutting blades of the lawn mower until their growth revealed a pleasing form to the eye of the caretaker, who permitted them to grow unmolested. Three of the above plants were growing in a very heavy lawn sod slightly higher in elevation than the surrounding ground. One grew in the shade of a hedge, where its roots mingled among those of the hedge plants, and three in close contact with a cement walk. These plants all produced many blossoms and a heavy seed setting followed. According to the statement of the property owner, this is the first season this plant has appeared in the lawn or in the immediate neighborhood. This observation covered a period of 25 years. Another interesting appearance of *Serapias Helleborine* this year for the first time was in a residential area on the shores of Cazenovia Lake, 16 miles east of Syracuse. Here the orchid grew abundantly in the back yard of a summer home. Furthermore, it has been found growing abundantly the past season in the bottomlands of various lakes in the vicinity of Syracuse, where in the past it occurred only sparingly.

The finding of this once rare orchid growing so luxuriantly in domesticated, as well as in natural habitats, is indeed interesting. If the present year's

distribution is a reliable criterion for the future, flower lovers of central New York may realize a lifetime desire and see orchid plants as abundant in their back yards as some of the more common plant species of the region. This assumption may be purely speculative, however, since so many factors not fully understood may play an important rôle in the growth and distribution of an orchid species in a specific region during any particular year. Nevertheless, the occurrence of *Serapias Helleborine* in domesticated habitats definitely indicates that it may ultimately adapt itself to such environments. With this in mind, the writer as well as others interested in the distribution habits of this plant gathered its seed during the present year, to be scattered and planted in such cultivated habitats as lawns, flower plots and shrub areas. In addition, the seeds have been sent to individuals in various regions of the United States in the hope that more information relative to its environmental demands and adaptations can be gathered.

*Serapias Helleborine* is not as spectacular in its beauty as several other species of the Orchidaceae; nevertheless, the tall leafy stem with its dense-flowered raceme is very attractive. Therefore, should this orchid prove itself to be adaptive to widely divergent habitats, nature will have again added an attraction to the home lot.

VERNON A. YOUNG

NEW YORK STATE COLLEGE OF FORESTRY

### I-INOSITOL IN CITRUS FRUITS

IN the isolation of ascorbic (hexuronic) acid from citrus fruits there is always obtained a residue insoluble in methyl alcohol which can be recrystallized from water.

This substance melts at 225–226°. A mixture with i-inositol gives no depression in melting-point, and the optical-crystallographic properties are identical with those of i-inositol. The optical-crystallographic properties of anhydrous i-inositol, recrystallized from water at the temperature of the boiling-water bath, were found to be as follows: substance occurs as irregular colorless fragments when crushed for study by optical-immersion method. The indices of refraction are:  $\alpha = 1.525$ ,  $\beta = 1.555$ ,  $\gamma = 1.570$ , all  $\pm 0.003$ . The double refraction is strong,  $\gamma - \alpha = 0.045$ . Biaxial interference figures common; optic sign –; 2 E not large.

The yields of i-inositol from ten liters of juice were as follows: Lemon = 1.24 g., orange = 0.47 g., grapefruit = 0.28 g.

E. K. NELSON

BUREAU OF CHEMISTRY AND SOILS

GEORGE L. KEENAN

FOOD AND DRUG ADMINISTRATION

<sup>1</sup> Gray's Manual, 6th and 7th editions; also Britton and Brown, 1st and 2nd editions of "Illustrated Flora of the Northern United States and Canada."

<sup>2</sup> A report from Dr. A. J. Eames, of Cornell University, Ithaca, N. Y., in personal correspondence.

## SPECIAL CORRESPONDENCE

THE LEONARD WOOD MEMORIAL FOR THE  
ERADICATION OF LEPROSY

THE Leonard Wood Memorial for the Eradication of Leprosy does more than memorialize in its name a great soldier, physician and humanist. It exemplifies and continues one phase of the work in which Leonard Wood himself was greatly interested in the Philippines, in common with other measures designed to safeguard the health of the native population. Lepers had been segregated and cared for through the humanitarian efforts of Franciscan monks for over three hundred years in Manila, but little progress had been made either in their care or in the understanding of the age-old disease from which they suffered not only in this locality but in the world in general. The Philippine Health Service in 1906 began to exercise greater and more intelligent care in the segregation and treatment of lepers, particularly through the establishment at Culion of a modern colony for them.

In 1922 Dr. H. W. Wade, who had long been active in the study of leprosy in connection with the Philippine Health Service, was sent as pathologist to Culion. No less important in the forward movement which has already begun to bear the fruit of progress in the study of this ancient disease was the fact that Dr. Wade's wife, Dorothy Paul Wade, was with him in this station on the fringe of the world. It became evident to both these inspired and devoted helpers of humanity that their countrymen should be informed of the little that was actually being done for these unfortunate victims of one of the oldest maladies in the world and how their fate might be bettered and their numbers decreased. With the active support and authorization of General Wood, Mrs. Wade came to the United States in 1925. Through the influence of General Wood's personal friends and admirers, and by her vivid and tireless presentation of this great humanitarian project throughout the length and breadth of the country, two million dollars was pledged from over fifty thousand subscribers. Additional sums are needed and continue to be offered even in these difficult times.

The men who volunteered their services as an Executive Committee of the Leonard Wood Memorial as it was then formed, the personnel of which has changed but little since that time, did much to inspire confidence in the public that the money subscribed would be wisely used. Their names include: Hon. Robert L. Bacon, Mr. Perry Burgess, Mr. Eversley Child, Hon. Dwight F. Davis, Mr. Robert

W. DeForest, Dr. John H. Finley, General James G. Harbord, Hon. Charles Evans Hughes, General Samuel McRoberts, Mr. Arthur Page, Mr. Kermit Roosevelt, Hon. Henry L. Stimson, Mrs. Dorothy Paul Wade, and Mr. Owen D. Young.

It was decided from the very beginning that the money so generously given should not be spent simply in the care of lepers, which is the business of local public health agencies, but more particularly in searching for the causes of the disease, the means of its prevention and finally its more certain cure. In spite of the fact that leprosy has been differentially recognized since biblical times, far too little is known of any of its fundamental aspects. The horror which the unhappy plight of the victim naturally arouses has been confused with the possible danger of contagion. Although the disease is directly or indirectly dependent on contact, the precise mode of its transfer is by no means known.

It seemed, first of all, that additional material facilities in the way of buildings were necessary in order that a more careful study of the disease could be made in the Philippines where it is so prevalent and whence this great investigative project took its origin. For this purpose something like \$400,000 was expended in the construction of an entirely new leprosarium in Cebu, pronounced by many leprologists the finest in the world, and at Culion in extensive construction in preparation for the memorial's research program. These buildings, which comprise new laboratories, research wards, housing facilities for the nurses and scientific personnel and a cabin cruiser to facilitate transportation, have been completed and handed over to the Philippine Government.

It soon became evident that a medical board was essential in any development of this sort. For that purpose recognized medical authorities, not only in this specific disease, but in general problems of health and disease prevention, have volunteered their services and include at the present time the following individuals: Dr. William H. Welch, *chairman*, Surgeon General H. S. Cumming, Dr. Victor G. Heiser, Professor W. G. MacCallum, Dr. Earl B. McKinley, Dr. Theobald Smith, and Dr. H. W. Wade. This board continues to advise on the general problems of expenditure of the funds which, in addition to the buildings already mentioned, have taken the form of the development of working possibilities in research in the Philippines and certain attempts at an arrival of an international understanding as to what the problem of leprosy means throughout the world.



Thus the memorial has rendered possible the calling of the first international conference on leprosy which took place in Manila in 1931, and an international *Journal of Leprosy* is about to be published by the International Leprosy Association with the financial aid of the Leonard Wood Memorial. Dr. Wade has been made medical director of the research aspects of the study in Culion and sent on a world tour of leprosaria in 1931-32. A recognized Philippine authority in the disease, Dr. José Rodríguez, was sent for special study in epidemiology to the Johns Hopkins University and has now returned to the Philippines.

The ultimate objective of the fund must be a direct attack through intensive investigation of the disease itself and perhaps in several centers where it exists. It was obvious from the first that highly trained experts must be chosen for this work and the choice of these experts and of the problems that they might propose to investigate in connection with leprosy were so important that it was judged necessary in 1932 to ask the cooperation of an advisory committee on research, consisting of the following members: Dr. Frederick P. Gay, *chairman*, Dr. J. A. Doull, Dr. Ernest W. Goodpasture, Dr. Esmond R. Long, Dr. Earl B. McKinley, Dr. Thomas M. Rivers, Dr. Malcolm H. Soule, and Dr. Hans Zinsser.

Before proceeding to the recommendation of problems and personnel, this advisory committee on research felt it essential to be placed in touch with the situation throughout the world, since most of them were chosen not in virtue of a direct and recent participation in the leprosy problem itself but rather through their broader contacts with research in the innumerable problems of epidemiology, pathology, bacteriology and immunology. For this purpose it is planned to send members of this group, as their time permits, either to the more thoroughly established stations in the Philippines or elsewhere for the first-hand investigation of specific problems, the detailed carrying out of which they may wish to recommend to the memorial for determined and prolonged study. During the current year Dr. Doull, Dr. Soule and Dr. Gay are to visit the two stations in the Philippines for the purpose of this survey and for actual work for a limited time in the problems of leprosy as they perceive them. Additional tours of inspection are not as yet provided for, but it may safely be foretold that the personal knowledge acquired and the international interest inspired by the contact which this group of scientists sets up will do much to pave the way for the eventual solution of this great problem.

F. P. G.

## SOCIETIES AND MEETINGS

### THE IOWA ACADEMY OF SCIENCE

THE forty-seventh annual meeting of the Iowa Academy of Science was held with Coe College at Cedar Rapids on April 21 and 22, with 268 members and visitors in registered attendance.

The presidential address, "Some Biological Contributions to Recreation," was presented by Professor H. E. Jaques, of Iowa Wesleyan College. Other papers of general interest were: "The Occurrence of Mottled Teeth in Iowa," by Carl T. Ostrem, D. A. Greenwood, H. A. Wilhelm and V. E. Nelson, of Iowa State College; "Suggestion as to Structure in Ionic Solutions," by G. W. Stewart, of the State University of Iowa, and "Note on the Purchase Price of a Bond," by John F. Reilly, of the State University of Iowa. The annual academy lecture was presented by Professor H. J. Gilkey, of Iowa State College, on "Building the Hoover Dam."

The following officers and section chairmen were elected for the forthcoming year: *President*, E. J. Cable, Iowa State Teachers College; *Vice-president*, Edward Bartow, State University of Iowa; *Secretary-Treasurer* and *American Association for the Advancement of Science Representative*, J. C. Gilman, Iowa

State College; *Editor*, Mrs. F. W. Nichols, Ames; *bacteriology* and *botany*, W. F. Loehwing, State University of Iowa; *chemistry, general* and *physical*, R. W. Getchell, Iowa State Teachers College; *chemistry, organic* and *biological*, V. E. Nelson, Iowa State College; *geology*, D. B. Gould, Cornell College; *mathematics*, J. F. Reilly, State University of Iowa; *physics*, E. P. T. Tyndall, State University of Iowa; *psychology*, Thomas McConnell, Cornell College; *zoology*, J. H. Bodine, State University of Iowa.

The academy convened in eight sections for the presentation of 152 papers of special interest. The retiring section chairmen made the following reports of their respective meetings:

*Bacteriology and Botany*: C. H. Werkman, *chairman*. The bacteriology and botany section presented a program of thirty-one papers and conducted a symposium on teaching under the chairmanship of Dean C. E. Friley, of Iowa State College. All meetings were well attended and the quality of the papers was high.

*Chemistry*: Leo P. Sherman, *chairman*. Papers were presented before the organic and biological section by Henry Gilman and students, V. E. Nelson,

and H. L. Keil, G. H. Coleman and others, J. B. Culbertson, L. Chas. Raiford, L. C. Bauguess and C. P. Berg, N. A. Clark, H. S. Olcott, H. Gregg Smith<sup>1</sup> and W. H. Seegers, on such widely diverse topics as: "The Progressive and Step-wise Decarboxylation of Furantetracarboxylic Acid" (Gilman); "The Effect of Substituents in the Formation of Thio-carbanilides by Various Methods" (Raiford); "The Rôle of Liver in Growth, Reproduction and Lactation" (Smith and Seegers); and "The Determination of Manganese in Biological Material" (Clark). The meeting was well attended and close attention was given to all the thirteen interesting papers. A joint dinner for all the chemists was ably presided over by Dr. Ben Peterson, of Coe College, who called upon Drs. Culbertson, of Cornell College, and F. E. Brown, of Iowa State College, for short addresses.

**Geology:** John E. Smith, *chairman*. The meeting of the geology section was instructive and well attended. Among the papers on stratigraphic geology were: "Section at Ft. Dodge Limestone Company's Mine"; "Stratigraphy of the Hopkinton Formation in Jones, Jackson and Clinton Counties"; "Iowa Stratigraphy on Methodical Scheme"; "The Kansas City Formation in the Pammel Park Area"; "Some Buried Pictured Rocks"; "The Structure of the Des Moines Series at Redfield, Iowa." On glacial geology were presented papers on "Contrasted Till Relief" and "Pleistocene Geology of Central Iowa." Papers related to geology were: "Possible Migration in the Very Dawning Period of Pueblo Culture" and "The Carbon Dioxide Cycle in Nature." An excellent paper on "The Status of the Devonian Beds at Middle Amana" was also presented.

**Mathematics:** L. M. Coffin, *chairman*. In addition to a number of papers on the history and teaching of mathematics, papers were presented on number theory, potential theory, geometry, differential equations, statistics, probability theory, mathematics of finance and mechanics. The joint dinner was addressed by Professors Smith, Rietz, Rusk and McGaw.

**Physics:** H. J. Plagge, *chairman*. The physics section of the Iowa Academy of Science met at Coe College, Cedar Rapids, Iowa, on April 21 and 22. All sessions were unusually well attended, and twenty-five papers, covering recent developments and investigations, were presented. At the annual dinner, held at the Roosevelt Hotel, Friday evening, Dr. G. W. Stewart spoke on the subject "Physics 'round the World," basing his lecture on his recent tour around the globe.

**Psychology:** Leigh C. Douglass, *chairman*. A total of twenty-eight papers, covering a wide range of subjects, was presented in the psychology section. These

papers, when classified, are as follows: abnormal, 3; art, 2; child, 3; education, 8; emotions, 2; music and speech, 5; physiological, 5. One of these papers, by Professor C. A. Ruckmick, of the State University of Iowa, on "What We Don't Know about Emotions," in which he summarized the research work that has been done in this field and charted the fields to be explored, was presented at the dinner meeting.

**Zoology:** Elery R. Becker, *chairman*. There were fifteen papers presented in the zoology section. Of these, three were concerned with the physiology of sex, two were purely physiological, four were anatomical in nature, two dealt with the parasitic protozoa, one presented the life history of the firebrat, two may be classified as ecologic, and one was of a systematic nature. One noticeable feature of the program was that most of the papers were given by the younger workers.

JOSEPH C. GILMAN,  
*Secretary*

#### THE KANSAS ACADEMY OF SCIENCE

THE sixty-fifth annual meeting of the Kansas Academy of Science was held at the Kansas State College, Manhattan, from April 13 to 15. The program consisted of approximately 160 papers given in general sessions on Friday and Saturday forenoons, April 14 and 15, and in the sectional meetings. Sectional programs in biology, chemistry, physics, psychology and junior academy were held on Friday afternoon. The entomology sectional program was held on Saturday afternoon under the auspices of the Kansas Entomological Society. A total attendance of 293 was recorded at the programs.

Dr. Philip Fox, director of the Adler Planetarium, Chicago, delivered the main address on April 14, at 8:15 P. M., under the auspices of the Science Club and Sigma Xi at Kansas State College. His subject was "The Architecture of the Heavens." At the annual banquet earlier in the evening the retiring president of the academy, Dr. Robert Taft, of the University of Kansas, delivered the presidential address on "Old Photographs, a Brief Review of the History of American Photography in the Period 1840-1880." Dr. Paul B. Lawson, of the University of Kansas, opened the annual meeting by a lecture on spiders in the evening of April 13.

The officers elected for 1933-34 were: *President*, J. W. Hershey, McPherson College, McPherson; *First Vice-president*, W. H. Matthews, Kansas State Teachers College, Pittsburg; *Second Vice-president*, E. A. Marten, University of Wichita, Wichita; *Secretary*, G. E. Johnson, Kansas State College, Manhattan; *Treasurer*, H. A. Zinszer, Fort Hays Kansas State College, Hays. The chairmen of sections are: *Biology*, H. E. Crowe, Friends University, Wichita,

<sup>1</sup> Deceased.



and (vice-chairman) Elsa Horn, Kansas State College, Manhattan; *chemistry*, W. W. Floyd, Ottawa University, Ottawa; *physics*, G. W. Maxwell, Kansas State College, Manhattan; *psychology*, J. B. Stroud, Kansas State Teachers College, Emporia; *entomology*, P. A. Read, University of Kansas, Lawrence; *Junior Academy*, Hazel E. Branch, University of Wichita, Wichita. Additional members of the executive council are: Robert Taft, University of Kansas, Lawrence; F. U. G. Agrelius, Kansas State Teachers College, Emporia; L. Oneley, Southwestern College, Winfield. Dr. F. C. Gates, of the Kansas State College, Manhattan, was reappointed editor.

State aid to the extent of \$300 a year was reported by the chairman of the state aid committee, Dr. W. J. Baumgartner, of the University of Kansas at Lawrence. The 1934 meeting will be held in Wichita.

GEORGE E. JOHNSON,

*Secretary*

### THE TEXAS ACADEMY OF SCIENCE

The summer meeting of the Texas Academy of Science was held at College Station, where it was the guest of the Agricultural and Mechanical College. At the banquet on May 19, a class of thirty-three new members, all from the faculty of the college, was introduced to the membership. Following the banquet Dr.

Mark Francis, widely known for his work on Texas tick fever and for his interest in the paleontology of the Gulf Coast, delivered an illustrated lecture relative to his findings in Texas. At the conclusion Dr. E. N. Jones, president of the academy, presented Dr. Francis with a certificate of life fellowship. Saturday was given over to three field trips. The botanical section under Dr. R. G. Reeves, of A. and M. College, visited locations where the local flora was best represented. The geological section, headed by Dr. H. B. Stenzel, of A. and M. College, and Professor and Mrs. F. B. Plummer, of the University of Texas, visited some newly discovered fossil deposits near the college. The third section represented a combination of interests and made a tour through the eastern part of the state, visiting various points of biological and historical interest. At the meeting of the executive committee arrangements were made for the annual meeting to be held at Dallas on October 20 and 21, and the invitation of Dr. Edwin F. Carpenter, secretary-treasurer of the Southwestern Division of the American Association for the Advancement of Science, for a joint meeting in May, 1934, was referred to the regular session of the executive committee for consideration.

H. B. PARKS,

*Secretary-Treasurer*

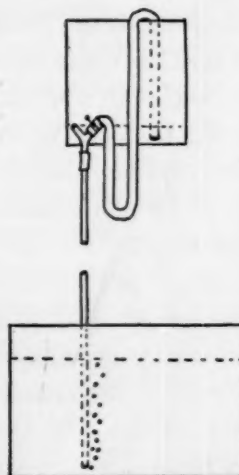
## SCIENTIFIC APPARATUS AND LABORATORY METHODS

### A SIMPLE AQUARIUM AERATOR

In the course of the school year it is frequently desirable to maintain aquaria, both of fresh and salt water, for intervals of a week or two. In order to accomplish this some system of aeration is usually necessary, but in many cases one feels that the purchase of an electric pump is hardly justified. Several fairly simple and efficient aerating devices have been described (Schaeffer,<sup>1</sup> Walker,<sup>2</sup> etc.), but they require that running water be available and limit the location of aquaria to within a few feet of a sink. The writer has been using, quite successfully, a very simple aerator, which can be constructed in a few minutes from materials available in most laboratories, requires no electricity or running water to maintain it, needs only a few minutes' attention a day, can not misbehave in such a way as to injure the contents of the aquarium or flood it with tap water, and allows the aquarium to be placed almost anywhere in the room.

Two lengths of glass tubing, one of one eighth inch diameter, the other a size larger; a Y tube preferably the size of the smaller glass tube; some rubber tubing

for connections; and a screw tubing clamp are needed. The larger tube is bent in the form of a "constant level" siphon, as shown in the diagram, the inlet end



being bent slightly to one side so that water can enter freely, even when this end rests on the bottom of a container. The Y, preferably a glass one, especially if sea water is to be used, is connected to the outlet end of the siphon by just enough rubber tubing so that the screw clamp can be fitted on between the end of the siphon and the Y. The open end of the Y should stand a little above the intake end of the

<sup>1</sup> A. A. Schaeffer, *SCIENCE*, 31: 955, 1910.

<sup>2</sup> J. H. Walker, *SCIENCE*, 73: 709, 1931.

siphon, and as near the level of the top of the outlet bend as possible. The siphon will then need no starting after it has once been put in operation. The second glass tube—the smaller one—is then closely connected to the stem of the Y. This tube should be at least eighteen inches long, for best results. Its length determines the depth to which air can be carried below the surface of the water in the aquarium below, and this drop tube should reach almost to the bottom of the aquarium, so that the bubbled air may come in close contact with as much of the water as possible. A vessel of some kind—a battery jar serves well—is now stood on some convenient support above the aquarium and is filled with water from the aquarium. The apparatus can be started easily by slipping a piece of rubber tubing about two feet long over the open end of the Y and sucking on it. As soon as the water starts to flow through the siphon, this tubing is removed and the screw clamp tightened until water no longer drips from the open end of the Y, but instead a series of air bubbles is sucked in. Once started, the only attention required is an occasional replenishing of the water supply from the aquarium below. Care must be taken, of course, that no debris which might clog the Y is transferred. With this piece of apparatus an aquarium can be kept near a window where the aeration will be supplemented by the photosynthetic activity of the plants, and by manipulation of the window a reasonably low temperature can be maintained. Under such conditions, if the aquarium is not overstocked, filling the reservoir two or three times a day will suffice to keep the water sufficiently aerated.

If desired, several aquaria can be placed in tiers, and an aerator be placed in each, leading to the aquarium below, so that only one upper reservoir need be filled to keep the series in operation. In that case care must be observed that the open end of the Y is at the normal water level of the aquarium. Any surplus water brought in by the aerator above will then serve to operate the aerator for the aquarium below.

This device has proved particularly useful when the tap water was chlorinated and it was necessary to bring pond water into the classroom. Also with marine material, when the amount of sea water available was limited, it has still been found possible to keep the animals alive in the laboratory for several weeks.

ERNEST C. DRIVER

SMITH COLLEGE

#### A NEW STOP-COCK CLAMP

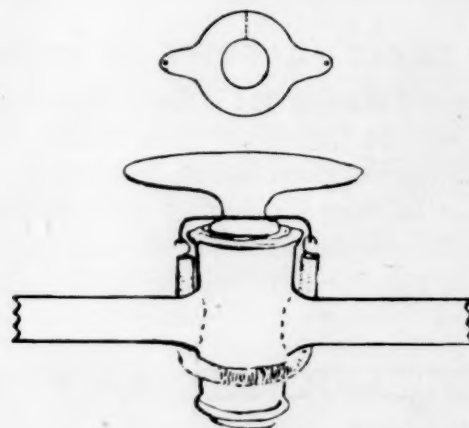
SOMETIMES it is necessary that glass valves be made relatively more leak-proof than the binder in the valve lubricant can assure. This is especially true if valves in a system are subject to pressure over consid-

erable periods of time. To overcome such difficulties in leakage, a spring clamp was devised and is here-with described.

A stiff collar is cut from sheet copper (.5-.7 mm thick) in a form similar to the drawing. It is then cut half across and opened to admit the neck of the glass plug. The ends of the collar are then turned down but so that they still clear the seat portion of the valve.

If the closed spring coil, which is used, can not be purchased, it may be made by winding No. 2 music wire<sup>1</sup> on a stiff iron wire or small rod held in the chuck of a breast drill—the latter clamped in a vise. After a 2-3 cm length of coil has been wound, it should be set by heat (in a flame) before removal from the small rod on which it is wound.

The spring tension on the collar varies, depending on the size of the cock and its use. However, as a



criterion for the usual size cock, an adjustment to give a pull of 100-200 g is found to be satisfactory. A moderate tension on the plug will not force the lubricant out appreciably and cause freezing of the valve if a good lubricant, as "Lubriseal," is used. The clamp may be plated if subject to corrosive vapors.

One notes that the collar of the clamp rests upon the shoulder of the glass plug but still permits its perfect freedom of movement; and that the plug may be removed and cleaned readily by extending the spring over the end of the plug seat.

This clamp has found satisfactory application on stop-cocks of manometers, vacuum pump distributors, gas analyzing burettes and other apparatus. Two stop-cocks at the base of one of the gas-analyzing machines—a multiple bulb side-arm type burette—supporting a meter column of mercury, were found to remain functional and leak-proof for weeks without cleaning.

ALDEN F. ROE

THE GEORGE WASHINGTON UNIVERSITY  
SCHOOL OF MEDICINE

<sup>1</sup> Obtained from large hardware stores.



## SPECIAL ARTICLES

THE ACTION OF THE PARENTERAL ADMINISTRATION OF SUGARS ON THE HYDROGEN-ION CONCENTRATION OF NORMAL AND MALIGNANT TISSUES IN LIVING ANIMALS<sup>1</sup>

THE principal factors—biochemical and physiological—which control the acid-base equilibrium of the blood of animals are well known. Very little is known, however, concerning the regulation of the acid-base balance in the tissues. Even in the case of the voluntary muscle, which has been subjected to intensive investigation during the last twenty years, it has so far been impossible to gain an adequate picture of the factors which may control the hydrogen-ion concentration of muscle tissue in living animals. Data obtained on isolated tissue have only limited value, inasmuch as the conditions prevailing in the body can not be duplicated accurately. Attempts to apply the customary colorimetric and electrometric methods to extracts or macerations of tissues have yielded figures differing by as much as one pH unit for one and the same tissue. This is due to serious technical errors, such as acid production during the preparation of the material, loss of CO<sub>2</sub>, interference of oxidation-reduction systems in electrometric estimations by means of metal electrodes, etc. More satisfactory results were obtained by Rous, who applied pH indicators to exposed tissues of living animals and, by noting the color change, obtained an approximate estimate of the hydrogen-ion concentration.

About a year ago we described a technique for the continuous measurement of the pH of the tissues in living animals, which makes use of a specially constructed capillary glass electrode in conjunction with a quadrant electrometer and potentiometer.<sup>2</sup> Further improvements in this method have been made since. A great advantage of the glass electrode over other electrodes is that it permits pH measurements in the presence of the oxidation-reduction systems which occur in all tissues. However, there is one objection to the method in that the electrode makes contact not with a single morphological tissue unit, but with the different cells comprising the tissue as well as tissue lymph. Direct contact with blood can be avoided by careful insertion of the electrode into the tissue.

Recognizing this limitation we believe from our extensive experience that the method is of real value in the study of various problems. We have applied it to the study of the nature of cancerous growth.

The work is based on the fact that certain tissues are known to ferment glucose with the formation of lactic acid. As a normal tissue we chose the voluntary muscle of rats, because of the ease with which it produces acid upon slight injury, a fact which from a technical standpoint furnished a severe test of the reliability of the method. On the other hand it was shown by Warburg and coworkers by experiments *in vitro* that lactic acid production is especially pronounced in malignant tissues, even in the presence of oxygen. Furthermore, Cori and Warburg have found that venous blood coming from a malignant tumor has a lower glucose and a higher lactic acid content than normal venous blood. The same investigators have also shown that the lactic acid formation in tumor tissue *in vitro* and *in vivo* can be increased by increasing the glucose supply.

We were therefore interested to ascertain whether it is possible to force the lactic acid production in voluntary muscle or malignant tissue by means of injection of glucose to such a degree as to cause an increase in the hydrogen-ion concentration. Having found that this was easily possible with malignant tumors, we decided to study also the action of other natural sugars obtained in pure form through the kindness of Dr. C. S. Hudson and his collaborators. The sugars were injected mostly intraperitoneally but sometimes subcutaneously as a 20 per cent. solution in doses of 600 mg per 100 g body weight. The animals—rats and mice—were deprived of food for 24 hours before the beginning of the experiments. They received pentobarbital in doses to produce a light anesthesia. The following tissues were studied: voluntary muscle of rats, Jensen rat sarcoma, Flexner-Jobling rat carcinoma, Walker rat sarcoma 325 and the spontaneous mammary mouse carcinoma of the New York State Institute for Malignant Disease.

In order to ascertain whether the observed increase in hydrogen-ion concentration is accompanied by increased lactic acid retention, Dr. J. M. Johnson, after the last pH measurement, analyzed the tissues for lactic acid by the method of Friedemann, Cotonio and Shaffer. The results indicate that there was always more acid present when the tissue had shown an acid drift as measured electrometrically. This means that there is an increased acid production throughout the tissue and not just locally at the electrode. In view of the relatively high dissociation constant of lactic acid it is not surprising that the tissue buffers are unable to prevent an increase in the acidity of the tissue. Whether or not other organic acids besides lactic are concerned in the production of the observed acid drift can not be decided on the basis of the present evidence.

<sup>1</sup> Read before the National Academy of Sciences, April 24, 1933.

<sup>2</sup> Carl Voegtlin and Herbert Kahler: *SCIENCE*, 75: 362, 1932.

We conclude, first, that the new method yields reliable data; second, that the buffer action of the tissues studied, particularly the malignant tumors, can be overcome by injection of relatively large doses of certain natural sugars and that the acid-base equilibrium is therefore a function of carbohydrate metabolism.

As to the possible significance of these results, it may be pointed out that the pH controls many important biochemical reactions, such as the action of proteolytic, glycolytic and other enzymes; oxidation-reduction; the state of tissue colloids, etc. The work of Jacobs and others, furthermore, suggests that lactic acid, being an organic acid, may have a peculiar action owing to its ease of penetration into cells. We have found that there is an acidity gradient: tumor-surrounding tissue-normal tissue. We therefore may well ask the question whether the excessive local production and accumulation of lactic acid represents an important factor in the destructive action of malignant tumors upon the surrounding normal tissue and upon the tumor cells themselves. Work along this line is under way.

CARL VOEGTLIN

H. KAHLER

R. H. FITCH

U. S. PUBLIC HEALTH SERVICE

### SOLAR VARIATIONS AND ATMOSPHERIC PRESSURE<sup>1</sup>

THE Smithsonian Institution has been measuring for 20 years, or more, the amount of solar radiation reaching the earth and computing from the observed data the value outside the atmosphere. These values prove to be variable, and it was deemed worth while to compare these variations with variations of atmospheric pressure on the earth in order to ascertain what relationships, if any, might be disclosed. For this purpose the formulas of correlation were used such as is now the custom to use in the comparison of variables.

The Smithsonian Astrophysical Observatory recently published a table giving the monthly means of the preferred solar values from three widely separated observatories for the interval 1921-1930. The monthly means for the 120 months included were compared with the monthly means of pressure for the same interval at 162 stations scattered over the earth's surface. These data were obtained from the various weather services of the world for publication in "World Weather Records" and were supplemented by means derived from daily charts of pressure for the North Pacific and North Atlantic Oceans.

<sup>1</sup> Read before the National Academy of Sciences, Washington, D. C., April, 1933.

The computed correlations disclosed the following relationships:

(1) With an increase of solar radiation the pressure increases in regions of the earth where the pressure is normally high and decreases in regions where it is normally low. In other words, the normal pressure gradients are increased and the normal circulation speeded up. It has been shown by previous investigations that with high solar radiation the low pressure band at the equator widens and the high pressure belts and centers in middle latitudes move nearer the pole, this displacement being proportional to the intensity of the solar radiation increase.

(2) The centers of greatest minus correlation are in regions of high vapor content and plus correlations in regions of low vapor content, indicating that the absorption of solar heat by water vapor plays an important part in determining the effect of increased solar radiation on the atmosphere.

(3) The centers of greatest minus and plus correlations change positions with the seasons, following the change in position of the areas of high and low water vapor; thus further proving the intimate relation between these conditions.

(4) In the regions of greatest minus correlation of pressure with increased solar radiation, the temperature and rainfall show plus correlations at least for solar radiation changes of short period.

(5) The computed amount of change of pressure and of temperature agree with expectancy.

(6) In considering the effect of solar radiation changes on the atmosphere there are evidently three factors to be considered, namely, intensity of the solar change, the seasonal changes in the atmosphere and progressive movements similar to atmospheric waves. It is possible also that temporary shifts in ocean currents and changes in water temperatures influence the results.

H. H. CLAYTON

### BOOKS RECEIVED

- ADAMS, LEVERETT A. *An Introduction to the Vertebrates*. Pp. v + 414. 290 figures. Wiley. \$3.50.  
 BARNES, ERNEST W. *Scientific Theory and Religion*. Pp. xxiv + 685. Macmillan. \$4.00.  
 DILLAVOU, E. R. *Business and Law*. Pp. xv + 494. McGraw-Hill. \$1.40.  
 FOLEY, ARTHUR L. *College Physics*. Pp. viii + 759. 453 figures. Blakiston. \$3.75.  
 ROMER, ALFRED S. *Vertebrate Paleontology*. Pp. vii + 491. University of Chicago Press. \$5.00.  
 SCHAUMSLAND, HUGO H. *The Great Enigma*. Pp. 93. Dutton. \$1.25.  
 WASHBURNE, CARLETON and HELUIZ WASHBURNE. *The Story of Earth and Sky*. Pp. x + 368. Illustrated. Century. \$3.50.  
 WHEELER, WILLIAM M. and THOMAS BARBOUR. *The Lamarck Manuscripts at Harvard*. Pp. xxi + 202. Harvard University Press. \$2.50.